AMENDMENTS

Please amend the claims as follows:

Please cancel claims 1-40 and enter the following new claims.

41. A method for correlating a vehicle with the road on which it travels based on cellular communication, the method comprising the steps of:

gathering sequence of events, such as call processing events or location related events from the cellular network, together with the location of the mobile unit at the timing of these events as a location reference and creating a learnt database; and

conducting analysis of new data, generated from communication with other mobile units that do not contain location reference in conjunction with the learnt database to match a sequence of reports to a specific route;

whereas the data is processed to overcome the problem of similar sequences for neighboring routes.

42. The method as in claim 41, where as the method for learning handover sequences comprises of:

handover chains in the learnt database are clustered according to a similarity algorithm so that each cluster contains at least similar N chains (N<=M, N=>1), where as N and M may vary for different route sections.

43. The method as in claim 42, where as the similarity algorithm comprises of:

each of the chains in a cluster of L cells has at least K (K<=L) cells that appear in the same order as in a header, where as K and L may vary for different route sections.

44. The method as in claim 42, where as ambiguous chain clusters (clusters in which at least one of the chains has similarity to chains related to a different route section) are filtered.

45. The method as in claim 44 where as clusters have similarity if at least for one of the chains within a cluster (1^{st} cluster) another chain is found in another chain cluster (2^{nd} cluster) that includes at least J (J<=L) cells that appear in the same order, and this chain relates to a different route section than the cluster, where as J and L may Vary for different route sections, both clusters are filtered.

46. The method as in claim 44 where as a cluster has similarity to a raw data chain if at least for one of the chains within a cluster another chain is found in the raw data that includes at least J (J<=L) cells that appear in the same order, and this chain relates to a different route section than the cluster, where as J and L may Vary for different route sections, the chain cluster is filtered.

47. The method as in claim 41 where as in the learning phase the accuracy level of a handover is calculated in one or a combination of the following ways:

using signal strength measurements to detect sharp decays in signal strength resulting in a handover and thus determine handovers accuracy level;

measuring the location spread of handovers between the same cells for different trips over the same route to determine handover accuracy level and average location.

48. The method as in claim 41 where as the analysis stage comprises of: matching cell chains from new drives to the learnt database by searching for a chain of J cells that has at least K (K<=J) cells that appear in the same order, both in a chain from the new drive as well as in a chain from the learnt database, whereas J and K may vary for different route sections; assigning the route of the chain from the learnt database to the new chain that was matched.

49. The method as in claim 48 where as the analysis stage includes a secondary matching procedure comprising of matching cells before and after the match we have detected in the initial stage by following the raw data chains in the learnt database backward and forward relative to the matched chain and looking for an L out of M (L<=M) cells match where as M is typically smaller than J, where as L and M may vary for different route sections.

50. The method as in claim 41, where as an analysis is conducted to detect the

vehicle location in specific points along the route comprises of:

extracting matching handovers (cell pairs) information of a new chain (location, timing, accuracy) from chains in the learnt database that were matched with it;

calculating location and accuracy of handovers in the new chain according to handovers from the extracted chains from the learnt database that relate to the same route section and contain the same cell pairs.

51. The method as in claim 41, where as in the analysis phase after a vehicle is correlated with the road it travels on, further analysis is conducted to detect traffic incidents as follows:

if the call have not ended yet and no new handover have been received for time T, the distance D to the farthest possible handover location to a possible next cell is used to calculate the maximal possible speed at the current route section as follows: Max Speed $<=$ D/T. If this speed is bellow a speed threshold S then a possible incident report is issued for this route section.

52. The method as in claim 41, where as the analysis of new drives is conducted based only on cell ID data.

53. The method as in claim 41, where as the analysis is conducted based on extraction of handover related messages only from the communication links between the switch and the base station controllers in a cellular network.

54. The method as in claim 41, where as the analysis is conducted based on extraction of only different percentage of the calls out of different parts of the cellular system.

55. The method for extracting traffic speed for a certain route section based on the rate of handovers (cell switching) for that route section where as the traffic speed extraction comprises of:

a calibration stage in which traffic speed of a route section is correlated with the rate of handovers for this route section on the same time.

comparing the measured Handovers rate with the rate of handovers in the calibration stage to extract the speed for the route section.

56. A method as in claim 41, where as the analysis stage comprises of:

matching cell chains from new drives to chains in the learnt database

filter out new chains that were matched with chains in the learnt database which represent more than one route section

57. The method according to claim 41, where as analysis is conducted to detect vehicle location in specific points along the route, the analysis comprising the steps of:

extracting matching handovers (cell pairs) information of a new chain (location, timing, accuracy) from chains in the learnt database that were matched with it. calculating location and accuracy of handovers in the new chain according to the handovers from the extracted chains from the learnt database that relate to the same route section and contain the same cell pairs.

58. The method according to claim 47, where as the location in time and accuracy level is used to calculate traffic speed per each route section.

59. The method according to claim 57, where as the location in time and accuracy level is used to detect traffic incidents.

60. The method according to claim 41, where as analysis is conducted to detect traffic incidents, the analysis comprising the steps of:

collecting handover's time density information for each route section;

alerting on probable incident whenever density of new chains decreases rapidly.

61. The method according to claim 41, where as analysis is conducted to detect incident clearance. This analysis comprises of:

collecting handover's time density information for each route section; and

notifying on incident clearance whenever, after an incident, the density of new chains increases significantly.

62. The method according to claim 41, where as analysis is conducted to detect traffic speed, the analysis comprising the step of:

a calibration stage in which traffic speed of a route section is correlated with the rate of handovers for this route section on the same time; the handovers rate is measured continuously and by comparing to the rate of handovers in the calibration stage the speed for the route section is extracted.

63. A method for correlating a vehicle with the road it travels on based on cellular communication, the method comprising the steps of:

collecting handover sequences statistics for the relevant area;

collecting traffic volume information for each route from external sources. Assigning sequences to routes according to volume comparison analysis; and

conducting analysis of new handover sequences from new drives in conjunction with the learnt database to identify a route at certain time points during cellular phone calls.

64. The method as in claim 41, whereas the method is used for areas where at least 2 roads are covered, at least partially, by the same 2 or more cells.

65. The method according to claim 41, where as virtual sensors detect the speed at certain specific locations across routes within the covered area and emulate the communication protocol between traditional road sensors and the control center in a hybrid traffic control system.

66. The method according to claim 41, where as further analysis is conducted to continuously update the learnt database. This analysis comprises of the follows:

estimate the location of handovers within matched sequences that do not appear in the database; and

add new matched sequences to the learnt database

67. The method according to claim 41, where as further analysis is conducted in order to detect changes in the cellular system and adjust the learnt database as follows:

monitor during the operational stage chains or clusters that their rate of matching decreases significantly or are not matched at all;

find new clusters that were rarely matched or not matched at all, that appear in the same locations, according to preceding or following chains; and

compare statistics of number of matches per cluster and find new clusters to replace clusters that are rarely matched.

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